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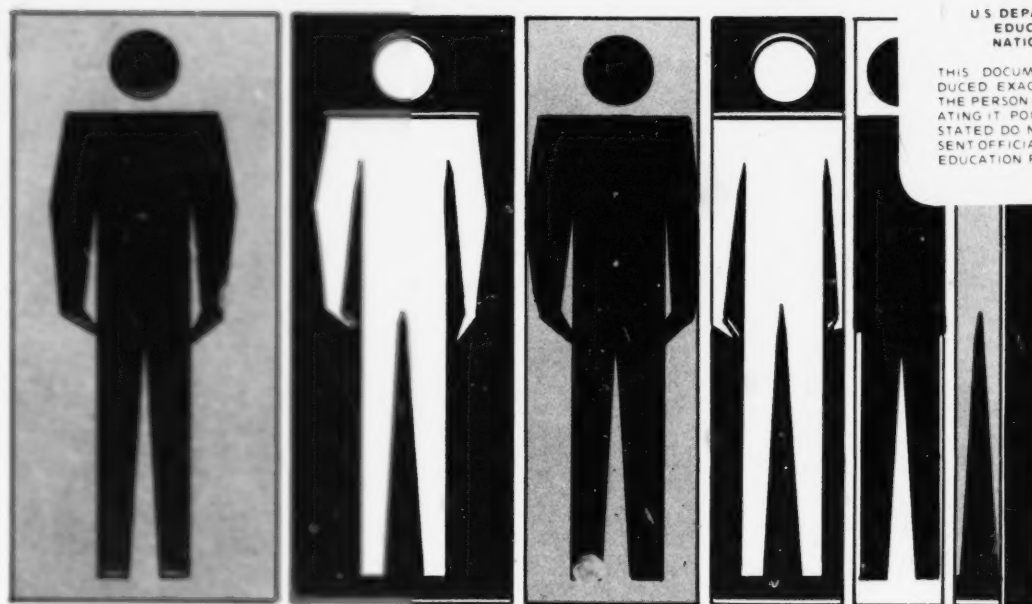
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ABSTRACT

This curriculum guide contains 20 modules for an integrated environmental study in the secondary schools. Each module, two to four pages in length, includes an overview, a list of concepts and a list of student objectives. In addition, an appendix has suggestions for initiating and implementing the program in the regular school curriculum. References and possible resources are given. (LS)

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FOR SECONDARY SCHOOLS

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MAN AND ENVIRONMENT

FOR

SECONDARY SCHOOLS

A Curriculum in Environmental Studies
For High Schools

Developed by a Workshop in Environmental Studies for Secondary Schools, conducted in Las Vegas, Nevada, November 13-17, 1972, under the sponsorship of the National Association for Environmental Education with a grant from the Office of Environmental Education, the United States Office of Education.

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FOREWORD

Man and Environment For Secondary Schools was created by thirty-five environmental specialists at a workshop held in Las Vegas, Nevada, in November, 1972. The workshop was sponsored by the National Association for Environmental Education under a grant from the Office of Environmental Education of the U. S. Office of Education.

This curriculum in Environmental Education grew out of a need recognized by the Association and the Office of Environmental Education for an integrated program in environmental studies for secondary schools, just as the original Man and Environment course met a similar need on the collegiate level in 1970.

It was determined prior to the workshop that the curriculum would be drawn up in modular form in order to assure its widest possible utilization in various school districts, on different levels and within the structures of varying educational philosophies. It was felt that teachers should have the widest possible freedom to choose areas of concentration which would be consonant with their own experience, academic discipline and the educational needs of their students.

The workshop addressed itself to four tasks. First, the overall objectives of the curriculum were established. Secondly, a list of appropriate topics for modules was established. Thirdly, the modules were developed in accordance with a predetermined form which included an overview, a list of concepts and a list of student objectives related

to each concept. Finally, the participants developed strategies for initiating an environmental program in a secondary school, for utilizing the modular curriculum within the regular school program, and for using the modules as a distinct course in environmental education. These strategies appear as appendices in this volume.

In selecting workshop participants a special effort was made to recruit practitioners in the field of environmental education, experienced secondary school teachers actually involved in teaching the natural sciences, the social sciences and the humanities from an environmental perspective. Other criteria employed were academic preparation and geographic location. A small group of environmental specialists from the college and university level were asked to serve as resource persons.

We are indebted to the participants and resource persons who worked with energy and dedication for three and one-half days to complete the task. Their only reward is the realization that they have cooperated in and contributed to a very relevant educational enterprise which will undoubtedly influence the thinking and behavior of a new generation of students toward the environment.

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CURRICULUM OBJECTIVES

To promote on the part of the student an awareness, concern and knowledge regarding the following concepts:

1. The biosphere is a closed system in which there are many complex inter-relationships;
2. Man has environmental problems;
3. Man's endeavors are inter-related with all aspects of his environment.
4. Environmental problems are not limited to any one group and affect all of us, no matter how subtly or at what point in time;
5. Unlimited growth of living species will have important consequences for the future of the environment;
6. The student is in a position to propose and effect changes in the environment;
7. As members of an affluent society and because of their value systems, Americans can have a disproportionate effect upon the environment;
8. Most environmental problems are extremely complex, do not lend themselves to easy solutions, and may involve only such identifiable solutions as will create new problems;
9. Environmental control may involve some relinquishing of individual freedom;
10. The earth's resources are finite.

MODULE I

THE ENVIRONMENT AND ITS PROBLEMS

MODULE 1A

THE MAN-ENVIRONMENT SYSTEM

OVERVIEW

The planet Earth is a closed system, an oasis perhaps, spinning and whirling within a larger galaxy known as the Milky Way. The resources of the earth remain constant. Similar to a closed aquarium-terrarium, the Earth's only input from outside the system is the daily infusion of sunlight and the occasional invasion of a meteor. Natural cycles circulate and recirculate matter and energy in a continuous transfer from place to place, from one form to another.

For 4.6 billion years there has been a continuous inter-reaction of the Earth's organic and inorganic matter. While these great cycles are global in nature, their delicate balance can be upset by man's intervention. All forms of life including man are encompassed and involved within the organic whole of the planet. Because all forms of Earth life are interrelated and interdependent, the survival of all life forms are intimately connected with the continuing existence of each life form. Ecological diversity is one of the essential global truths of our finite environmental system.

CONCEPTS

- A. The Universe: its vastness; probability of other solar systems; distance and time factors indicate there is "nowhere to go".

The Solar System: its origin

The Earth: its formation as a unique planet; formation of physical and living organisms; the Earth as a closed system.

- B. First ecological crisis in primordial times: entry of photosynthesis.
- C. The delicate balance of life.

- D. Evolution of life to man. The "Web of Life".
- E. Second ecological crisis: Now.

STUDENT OBJECTIVES

- A. The student will recognize that the Earth is a closed system.
- B. The student will recognize the complexity of life support systems.
- C. The student will recognize the fragility of the genetics of the biosphere.
- D. The student will recognize that he is one component of the system.
- E. The student will recognize the need for a quality environment.

MODULE IB

IDENTIFICATION OF ENVIRONMENTAL PROBLEMS

OVERVIEW

Man is at a very critical stage in his evolutionary development. He has treated his planet in a way that will effect the extinction of his own species if he continues present patterns of destroying the life-giving qualities of the Earth.

Man as an intellectual being is capable of perpetuating his species, but he must change his value system and his behavior toward the environment if he is to survive. Nothing short of a cooperative effort on the part of the international community will restore the balance of nature.

In this module an attempt is made to give the student a general idea of the basic environmental problems, the chief areas of concern, the main threats to the environmental system and the hazards to individuals. A beginning will be made at identifying solutions to the problem.

CONCEPTS

- A. The "laws" of ecology which, when violated, lead to environmental problems are:
 - 1. Everything is connected to everything else.
 - 2. Everything has to go somewhere.
 - 3. There is no such thing as a free lunch.
 - 4. Nature knows best and always bats last.
- B. Principal areas of concern in man-environment interrelationships are:
 - 1. The energy economy
 - 2. The agricultural economy

3. Industry and households
 4. Use of space
 5. Political problems
- C. Main threats to our environmental system are:
1. Loss of amenity
 2. Human health
 3. Genetic damage
 4. Shift in ecological balance
 5. Inability to meet survival needs
- D. Main hazards to you and me today are:
1. Man's effect on the global climate
 2. Radio-activity
 3. Pesticides and fertilizers
 4. Erosion
 5. Burdens on the receiving system: air, water and noise pollution
 6. Decay of the central urban city
- E. Over-accelerated use of the environment
- F. Approaches to solution should be:
1. Individual
 2. Community
 3. State/region
 4. National/international
- G. Perspectives on the over-all problem are:
1. Ecological

2. Engineering
 3. Economic
 4. Esthetic
 5. Ethical
 6. Social
- H. Our goal: an ecological conscience, marked by:
1. Awareness of environmental problems
 2. Understanding of underlying principles, issues and options
 3. Commitment to individual and group action in the public interest.

STUDENT OBJECTIVES

- A. The student will identify local environmental problems which affect his life closely.
- B. The student will recognize that personal opinions and biases affect one's view of environmental problems.
- C. The student will develop a personal understanding of his own relationship to the environment.
- D. The student will recognize that he is a member of a large social structure which, collectively, has an impact on the environment.
- E. The student will recognize his individual responsibility to strive for environmental quality.

NOTE: Acknowledgment is made to Barry Commoner for the expression of concept A and to John Brubaker for concepts B, C, D, and E.

MODULE 2

AIR POLLUTION

OVERVIEW

The air we breathe today is a mixture of various gases as well as selected solids and liquids. These gases, essential to all life, have resulted from evolutionary changes over billions of years. These modifications, which continue today, have produced air pollution levels which may be affecting and accelerating the evolution of various species. Since all life is dependent on one or more of the air's constituent gases for survival, it is the common property of all living organisms. Air pollution by either man or nature is of vital concern to all because of the differing tolerance levels of various life forms.

The eventual survival of species is threatened by various possible air related eco-catastrophes: 1) the oceanic plankton, which produces a large portion of the Earth's oxygen; 2) the greenhouse effect which involves too much carbon dioxide; 3) reduction of the quality of life, as related to aesthetics, recreation and mobility; 4) health problems in humans, especially emphysema and related respiratory diseases.

Local, regional and national air pollution problems are inter-related. There is also a continuing interdependence of air pollution on water and land pollution. Natural, geographic and man-made environments also modify the patterns of air pollution.

CONCEPTS

- A. Air is essential for all living things.
- B. Properties of polluted air are affecting the health and well-being of all of us, including plant, animal, and non-living things which share this planet Earth.
- C. Organisms have adapted to ranges of tolerance and limits to changes of air composition and concentrations.
- D. Air consists of various components, some natural and others man-made or imposed, some of which are beneficial to certain species while detrimental to others.

- E. The aesthetic quality of community life can be adversely affected by air pollutants.

STUDENT OBJECTIVES

A. The student will:

1. observe respiratory mechanisms in plant and animal forms through experimentation, field observations, and experience, testing the truth or falsity of the concept that air is essential for living things.

B. The student will:

1. research and gather data concerning effects of air pollution on living and non-living things (humans, plants, and inanimate objects).
2. engage in contracts or informal alliances with agencies dealing with air pollution in the community, region or state.

C. The student will:

1. understand the workings of a diversity index as it relates to air pollution and the application thereof.
2. set up a series of experiments, or describe through some media the truth or falsity of a statement regarding tolerance limits.
3. perform comparative studies on lung tissues obtained from veterinarians, city pounds, museums, hospitals, coroners' offices, research universities, any commercial retail food store, etc.

D. The student will:

1. be able to identify natural and man-made pollutants (i. e. major pollutants: sulfur dioxide, photochemical smog, nitrogen oxides, hydrocarbon vapors, carbon monoxide, lead bromide, and dust fall).
2. use various plants as environmental indicators and monitors, as well as non-organic indicators in order to carry out data-gathering processes, mapping, slidetape shows, etc.
3. identify major polluters within the national, regional and local areas.

4. demonstrate the effects of polluted air on sense perceptors.
5. demonstrate how one's various senses can give information about the nature and quality of air.
6. demonstrate limitations of sensory perception of pollution in the atmosphere.
7. examine the long term effects of pollutants on man.

E. The student will:

1. be able to determine aesthetic implication of air pollution.

MODULE 3

ENVIRONMENT: GOVERNMENT, LAW & SOCIAL ASPECTS

OVERVIEW

Just as there is a natural or biophysical aspect of the environmental ecosystem, so there is a human or politico-social aspect, each affecting and being affected by the other. Two themes run throughout this module: first, the extent to which environmental concerns are involved in the functioning of the American political process today; secondly, an interpretation of the development of social concepts, the problem situations that selected actions were intended to meet, the reasons why we chose these rather than alternate solutions, and the continuing stresses today. We look at man and society as organized - or not organized - to deal with environmental problems today through the formal executive, legislative, and judicial departments of government at all levels, through the conflict-oriented phases of political processes, and through a variety of voluntary eco-action organizations.

The student is introduced to political and social strategies for influencing public opinion and governmental decisions regarding the environment. This module is the practical "civics" of environmental studies.

CONCEPTS

- A. Man can learn to manipulate, control and effect change within the political arena.
- B. The law is an instrument to effect and/or impede environmental change.
- C. The function of government: is it to lead or serve?
- D. Judicial, executive, legislative areas of government are interrelated but each can promote or obstruct progress toward a good environment.
- E. Establishment of governmental priorities create conflict and militate against environmental change.

- F. Social-economic-environmental concerns and law priorities overlap.
- G. Political environmental conflicts are reflections of varying value systems which in turn are the extension of individual life styles.

STUDENT OBJECTIVES

- A. The student will:
 - 1. identify local individuals, representatives of agencies and institutions dealing with the environment.
 - 2. identify the resources available from these individuals and agencies.
 - 3. identify the capacity of these individuals and agencies to respond to specific environmental problems.
 - 4. determine strategies for positive action based on this information.
- B. The student will:
 - 1. be aware of existing local, state and federal laws.
 - 2. be aware of legal, human, and environmental resources.
 - 3. be able to trace the evolution of environmentalism through:
 - a. law
 - b. institutions
 - c. instruments of change
 - 4. identify areas requiring development of new environmental legislation and public action.
- C. The student will:
 - 1. participate actively in local and/or national affairs, through:
 - a. observation
 - b. identification
 - c. participation.
 - 2. develop and participate in a realistic environmental problem simulation.

D.-G. The student will:

1. develop case studies regarding specific environmental problems which reflect his own concern for environmental conditions.
2. generate alternate courses of action based on these case studies.
3. research current environmental legislation, its formulation, development, implementation and applicability to a specific environmental problem.
4. accept a personal responsibility for the environment.

MODULE 4

THE ECONOMICS OF ENVIRONMENTAL PROBLEMS AND SOLUTIONS

OVERVIEW

In this unit the student is presented with the hard fact of life that environmental degradation or its restoration is directly related to his pocketbook. Fundamental to this module are the two basic laws of ecology of Barry Commoner: 1) everything is connected to everything else; and 2) there's no such thing as a free lunch - in the world of nature just as in the world of man. The student is exposed to what might be called the money ecosystem, whose first principle is "money talks", to the history of "cowboy economy" which is characterized by the exploitation of resources, particularly those in the "commons" of Garrett Hardin, and to the growing conflicts between private rights and public goods.

The teacher should discuss the inherent flaws of an economic system that fails to recognize the hidden costs of producing a product, the effects of altered growth rates in population and gross national product on American life and the environmental impact of foreign economic and social systems. The next consideration is the relationship between economics and environmental improvements.

After an examination of the advantages and disadvantages of the profit system, it should be stressed that there will be no easy, free solution, but only choices or trade-offs which will be difficult and expensive, at least in the initial stages. It should be noted that a country as affluent as the United States can afford environmental quality if its people want it. Means must be found to generate as much wealth from environmental improvements as from environmental exploitation.

Throughout this module the student is confronted with two basic questions: Do you really want to pay the cost of a good environment? Considering ecological principles, engineering capabilities, aesthetic reality and economic resources, what is the best way to pay for a good environment? The student should leave this unit with two basic understandings: first, the American environment and the American economy are interrelated; secondly, the student as an individual and as a member of society, is in a position to make changes which will reverse present environmental trends and lead Americans to the fulfillment of its great potential.

CONCEPTS

- A. There is a relationship between economics and the environment.
- B. There is a relationship between public and private property in environmental problems.
- C. Money talks.
- D. The product-cost does not truly reflect the total cost.
- E. An altered population growth rate directly affects the economy and, therefore, the environment.
- F. The profit making system can be a solution to environmental problems.
- G. Dollar values can be placed on environmental trade-offs.

STUDENT OBJECTIVES

- A. The student will:
 - 1. define economics and ecology
 - 2. discuss the needs and wants of man through history
 - 3. discuss the changing role of economics in meeting man's needs.
- B. The student will investigate the following questions:
 - 1. what is property?
 - 2. who owns it?
 - 3. who controls it and how?
 - 4. when does property become an environmental concern?
 - 5. who owns natural resources, i. e. air, water, minerals, gas, etc.
- C. The student will investigate and answer the questions:
 - 1. what is money?

2. where is it? (in your family, community, county, state, country and the world)
 3. who controls it?
 4. how does your school get its money? who controls it?
- D. The student will:
1. itemize the hidden costs of the production of a retail product
 2. itemize the actual cost of an item
 3. try to discover who pays for these costs.
- E. The student will:
1. examine the effects of a population increase on the economy and environment
 2. examine the effects of a population decrease on the economy and environment
 3. examine the effects of a stable population on the economy and environment
 4. discover what factors affect the population growth rate.
- F. The student will investigate:
1. successful (profitable) and unsuccessful (unprofitable) recycling programs
 2. monetary incentives and penalties for stabilizing populations
 3. monetary incentives and penalties for pollution abatement
- G. The student will determine how to place monetary values on trade-offs.

MODULE 5

POPULATION AND THE ENVIRONMENT

OVERVIEW

The world ecosystem is a dynamic system. Populations within this system are constantly changing in numbers, compositions, and distribution due to the influence of both natural and man-made factors. Increased human population growth has created many personal, social, and ecological problems, and has complicated the solutions of many others. Action to stabilize the world's population has given rise to a number of controversial issues involving the fundamentals of life itself. Yet, the present rate of population growth, unprecedented in history, has reached the point where future alternatives for population change must be mapped in order to preserve the existence and quality of life on this planet.

CONCEPTS

- A. Demographic data provides information and methodology for understanding concepts of population changes.
- B. A knowledge of population trends in the United States and international communities helps man to understand past and present population changes.
- C. Human and other populations within the earth's ecosystem are constantly changing in numbers, composition, and distribution. Factors producing these changes emerge from both natural and man-made systems.
- D. Man should understand the implications of population trends and determine alternative plans for the future. By pooling human resources, man is capable of developing realistic and operational solutions to problems of population change.

STUDENT OBJECTIVES

- A. The student will:
 - 1. define and understand the following terms and their relationship to each other: fertility, mortality, immigration, emigration, growth rate, exponential growth, and doubling time.

2. understand the data collected by the U. S. Bureau of the Census including its population analysis studies of composition (by age, sex, race, ethnic groups, employment, education, income, and housing) and geographic distribution; and how to read life tables.

B. The student will:

1. define what constitutes a demographic trend for both human and non-human species.
2. identify demographic trends in the history of the United States and discuss their causes.
3. identify demographic trends and their causes throughout the world.
4. understand the following factors which impinge on demographic trends:
 - a. war
 - b. famine
 - c. disease
 - d. agriculture
 - e. medical science
 - f. industrialization
 - g. urbanization
 - h. immigration
 - i. available resources
 - j. social conditioning

C. The student will:

1. understand population changes in biological ecosystems caused by the following natural factors:
 - a. food
 - b. climate
 - c. disease
 - d. geography
 - e. habitat
 - f. interrelationships between species
 - g. natural selection
 - h. micro- and macro-evolution
2. identify and discuss recent changes in United States population size, composition, and distribution.

3. identify and discuss recent population changes in the world community.
 4. understand the role played by the following factors in human population change:
 - a. social conditioning
 - b. education
 - c. religion
 - d. equal opportunities
 - e. economic development
 - f. politics
 - g. resources and environment
 - h. availability of birth control
 5. establish interrelationships among the above factors.
- D. The student will:
1. understand the effect of increased human population on other living organisms.
 2. define and discuss future population models such as the MIT study Limits to Growth, and PRB's three alternative growth curves.
 3. review problems related to population change in the United States and in international communities. Include:
 - a. housing
 - b. employment
 - c. education
 - d. food
 - e. loss of open space
 - f. resource depletion
 - g. environmental pollution
 - h. urban sprawl
 - i. transportation
 4. understand the need for balance between population growth and economic development.
 5. understand the relationship between population growth and international relations.
 6. examine suggested solutions to the problem of increasing population; discuss issues related to possible solutions such as:
 - a. life style changes
 - b. roles of women and equal opportunities

- c. genetic engineering
- d. abortion
- e. positive and negative economic incentives
- f. sterilization
- g. family planning programs and birth control research
- h. economic and social effects of zero population growth
on the United States and the world.
- i. immigration policies
- j. euthanasia

MODULE 6

THE INTERNATIONAL DIMENSION OF ENVIRONMENTAL ISSUES AND ECOLOGICAL REALITY

OVERVIEW

Because of the dynamics and cyclic nature of the man-environment system, the environmental problems of our nation are often the problems of other nations and vice versa. Environmental pollutants and ecological imbalance are not limited by regional or national boundaries. The finite nature of the planet's resources and livable space prohibits the disproportionate use or mindless exploitation of non-reuseable resources by individual nations. A nation's use of its own and world resources is dependent on its own civilization and culture, its living standard and life-style and its use of scientific and technological advances.

The long range trends of global urbanization and industrialization, whose growth has been accelerated by modern means of communication and transportation, have an international dimension which demands a market exchange of trade, raw materials, ideas, managers, etc. International cooperation, agreement and understanding, are essential, therefore, if the environment of the Earth is to remain habitable for man and other living things.

A global environmental ethic is needed and individual citizens of the Earth must subscribe to it if the resources of the Earth are to be preserved. It is hoped that the current international concern for the environment will produce such an ethic and will lead to the restoration of the Earth's ecologic health and diversity.

CONCEPTS

- A. There is a need for international environmental institutions and organizations which respond to environmental issues and ecological realities.
- B. Environmental problems and ecological realities supercede regional and national boundaries and their impact is global.

- C. Cultural, spiritual and social differences have had a unique impact upon the total ecology of the planet in the past and will continue to do so in the future.

STUDENT OBJECTIVES

A. The student will:

1. examine the relevance of international law
2. learn how international laws are formulated
3. study the process of implementing international law
4. use case studies dealing with specific countries
5. assess the effects of international law, especially the breakdown of international behavior patterns
6. appraise the capability of international organizations to respond to environmental problems.

B. The student will:

1. identify international health problems
2. identify the needs and pressures of international communications systems
3. understand the increasing mobility of physical and ideological phenomena
4. examine contemporary population pressures
5. study the conflict and limitations of material values and identify the relationship between national concerns and international problems
6. understand that the interrelationship of eco-systems imposes restrictions on national self-sufficiency
7. examine the interdependence of the political and economic realities of developed and developing countries.

C. The student will:

1. utilize the concept of relativity in a comparative study approach.
2. inform himself about other cultures and will identify commonalities and differences in the behavior, value systems and life styles of these cultures.
3. identify spiritual and cultural diversity among civilizations and the effect of these diverse belief systems on the creation of a shared global ethic.
4. develop an historical perspective which is applicable to a process which maximizes gain and minimizes the negative consequences of future environmental action.

MODULE 7

THE INDIVIDUAL AND WHAT HE CAN DO

OVERVIEW

Learning about the environment should be an active process in which students participate in the solution of specific environmental problems which are related to the resolution of the global environmental dilemma. This approach is recommended for two reasons: first, educators believe that the inquiry method is a superior learning technique, and, secondly, critical environmental problems lend themselves easily to this approach. However, student involvement should be responsible and intelligent, and it should lead to sensitivity about the environment, individual growth, self-esteem and commitment.

Such a learning process not only facilitates the student's current learning, but provides a model for future study and action, both as an individual and as a member of voluntary citizen groups.

What can the individual do? He can become informed about environmental problems, he can accept responsibility for the quality of his environment, he can become involved in individual and group programs to improve the environment, and he can develop a sensitivity to the world in which he lives.

CONCEPTS

- A. The individual should become informed about his environment. This is a process of identification of problems, gathering data and synthesizing information. Underlying this concept are the presuppositions that each individual is a member of many eco-systems and that the aesthetic quality of life is a good in itself.
- B. The individual should be involved. Involvement is contingent upon a person's being informed and responsible. The person who wants to be involved should develop a positive self-image, remain flexible to change, be open to interdisciplinary learning approaches and recognize that group involvement and cooperative effort are good and necessary in today's world.

- C. The individual should be responsible. The responsible person is one who acts from rational motives, chooses a responsible life-style, is open to continuous evaluation and feed-back, and chooses wisely his educational, occupational and life goals.
- D. The individual should be sensitive to the environment. Sensitivity is the ultimate result of being informed, involved and responsible.

STUDENT OBJECTIVES

- A. The student will:
1. identify citizen action groups, their specific goals, functions, and structure
 2. identify environmental issues
 3. identify the process of governmental policy making
 4. identify decision makers and policy makers
 5. know rules, regulations, and laws regarding the environment
 6. know who enforces present rules and laws
 7. identify community, natural and human resources and the people responsible for their management
 8. know and recognize interdependent roles of all eco-systems
 9. identify opportunities for maintaining and improving environment
 10. identify alternatives for functions
 11. know specific cultural life styles
- B. The student will:
1. participate in citizen action groups
 2. form, or create citizen action groups, e. g. recycling projects
 3. determine adequacy of present regulations and respond to inadequacies with action letters, direct communication with decision-makers, lobbyists, mass media, etc.

4. correct environmental abuses, e. g. litter control, urban blight, zoning, etc.
5. communicate directly with legislators and other decision makers
6. use media effectively
7. implement work-study projects
8. develop skills for effective group membership

C. The student will:

1. make an honest rational assessment of alternate modes of action
2. be responsible for acting upon his own personal value system
3. seek feed back and evaluate continually his personal activity and impact on the environment
4. make responsible decisions and act upon them even though they may conflict with personal preferences.
5. alter the environment to enhance its function and quality

D. The student will become sensitive to the environment.

MODULE 8

TRANSPORTATION & THE ENVIRONMENT

OVERVIEW

Transportation has helped transform our society from a rural, agrarian-based society to an urban, industrialized society. Various kinds of transportation have been involved in this process and have had varying effects on the environment. The choice of transportation has produced certain stresses on natural and man-made systems. It is important to know that there are alternate types of transportation. Students should know how transportation systems are planned and should actively participate in the planning process. They should know how different transportation systems affect their community and individual life styles.

CONCEPTS

- A. Transportation is essential to the fulfillment of man's basic needs of food, clothing and shelter and has a major effect on his life style.
- B. Transportation has global, social, ecological, economic and political impact.
- C. Transportation has a major effect on land use planning.
- D. All modes of transportation have a direct effect on natural resources.
- E. Technological advances have affected modes of transportation.

STUDENT OBJECTIVES

- A. The student will:
 - 1. identify the ways in which transportation helps to satisfy man's basic needs for food, clothing, and shelter locally.

2. compare the above with ways used in localities in other nations
 3. explain how oil is transported from the Near East to his community
 4. explain how a shirt is transported from Tiawan to his community
 3. explain how beef is transported from Argentina to his community
 6. explain how timber is transported from the Pacific Northwest to Japan to be made into plywood for Chicago
 7. discuss ways in which modes of transportation are interrelated
 8. discuss trade-offs: use of transportation in relation to health, pollution, economics, convenience and status.
- B. The student will:
1. identify social effects of transportation on his community
 2. identify ecological effects of transportation on his community
 3. identify economic effects of transportation on his community
 4. identify political effects of transportation on his community
 5. identify the interrelatedness of each of the above
 6. identify the impact of each of the above on a global basis.
- C. The student will:
1. compare the land requirements and cost required by different modes of transportation to provide a given service such as:
 - a. travelling four city blocks
 - b. travelling from New York City to Las Vegas
 - c. travelling from Hawaii to San Francisco
 2. determine the effects of relocating or constructing new transportation facilities in the local area
 3. identify the transportation planning agencies on a local, state federal and international level
 4. plan an alternative transportation system to solve an existing problem in the community.

D. The student will:

1. identify the natural resources required for each mode of transportation (include manufacturing process)
2. classify modes of transportation according to whether or not renewable resources are used.

E. The student will:

1. determine technological advances which have affected modes of transportation
2. determine the social, ecological, economic, and political impact of changes in modes of transportation.

MODULE 9

URBANIZATION

OVERVIEW

Urbanization is the process by which increasingly large numbers of people are concentrated in relatively small areas called cities. Before 1920 the population of the United States was predominantly rural; shifts in population to the cities made it predominantly urban at that time. The same pattern of growing urbanization is found throughout the world with the developing nations urbanizing at an even more rapid rate than the developed countries. It is expected that 60% of the world's population will live in urban areas by the year 2000, an increase of 35% since 1900.

People are attracted to the city by employment opportunities, social and cultural benefits, accessibility to goods and services. However, as urban population grows, the natural ecological system is disrupted, open space is diminished and a host of personal and environmental problems are created. If cities are to survive and serve their inhabitants in beneficial ways, new urban planning strategies, involving sound ecological principles, must be created and implemented.

CONCEPTS

PRESENT

- A. Physical characteristics of the city may determine its metabolism as a dynamic system which has disrupted the natural geography and ecological system.
- B. Cities as unique residential and business entities, possess economic, political, and social factors which are forever changing.
- C. Cities demand exterior resources and create vast resource demands and waste disposal problems. They are not self-supporting ecosystems.
- D. Since cities change people and people change cities, problems may exist due to closed and forced niche-habitat relationships in the urban area.

- E. A unique population-community inter-action exists within the urban area, in that those living within it do not wholly determine its operational mechanism.
- F. Cities disturb the natural environment and superimpose a new ecology.

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- G. Early cities were initially established for the survival and well-being of man.
- H. Geography and resources were the basis for the original location of urban areas; the character of a city may be determined by its natural and man-made environment.
- I. The character and purpose of a city change in time with respect to a dynamic interaction of: (a) different cultures; (b) economics; (c) the amount, quality, and use of land; and (d) changes in life styles.
- J. The trends in urbanization have changed over the years.

FUTURE

- K. Planning, based on sound ecological, humanistic and social principles, is essential in the urbanization process on short, intermediate, and long-range levels.
- L. Recognizing that a mixture of lifestyles determines the effectiveness of the planning process, all elements of the total population must be brought into the planning process.
- M. To minimize future problems, a planning structure must employ flexible, responsive, effective, and personal communication processes.

STUDENT OBJECTIVES

- A. The student will:
 - 1. survey and identify the principal physical characteristics of the urban center.
 - 2. show how the physical characteristics determine the metabolism and character of the urban center.

3. identify and show how the dynamic urban systems have disrupted the natural geology and ecology.
- B. The student will identify recent changes in the residential, business, economic, political and social factors of his urban area.
- C. The student will identify, classify, quantify and determine the flow of resources and waste in his urban area.
- D. The student will:
 1. identify and classify the various niches and habitats in his urban area and show relationships between them
 2. analyze and account for observed mental, physical, social and economic phenomena.
- E. The student will:
 1. observe the interaction within community
 2. determine the inside and outside factors controlling the operational mechanisms.
- F. The student will:
 1. observe a natural environment
 2. reconstruct the growth of the community
 3. understand how the changes took place
 4. survey the community to determine what new ecology has been superimposed.
- G. The student will:
 1. determine the factors involved in establishing the urban center initially in terms of man's needs at the time
 2. compare and contrast the above with other urban centers.
- H. The student will:
 1. determine how the local geography and resources were involved in the initial establishment of the urban center

2. identify how the natural and man-made environment determines the character of the city.
- I. The student will:
1. survey and show how the following have changed the character and purpose of the city: cultural interaction; economics; amount, quality and use of land; life styles
 2. identify the interaction mechanisms.
- J. The student will:
1. identify and illustrate the trends which have and which are changing his city
 2. account for the trends
 3. compare and contrast the above trends with other cities.
- K. The student will:
1. identify the ecological, social and humanistic principles which should govern urban planning
 2. identify and relate the elements of the planning structure on a local, state, and federal level
 3. through direct observation and communication determine to what extent the principles identified above are governing urban planning.
- L. The student will:
1. determine the composition of the elements of the planning structure and determine the life style represented in the elements
 2. define the participants' role in the planning process .
- M. The student will:
1. determine the quality of the communication in the planning process
 2. specify improvements which might be made in the planning process .

MODULE 10

SOUND POLLUTION

OVERVIEW

It is estimated that the level of sound in the modern world increases at a rate of one decibel every year. Although a level of 80 decibels is considered loud and 120 decibels is dangerously high, some jet engines produce 103 decibels from twelve hundred feet, subway cars create 105 decibels for passengers, motorcycles register well over 100 decibels and jackhammers over 120. Trucks with faulty mufflers can produce as much sound as one hundred cars.

What are the consequences of this rising level of sound? It is estimated that three out of five human beings have suffered some hearing impairment and many young people are prematurely deaf. Supersonic sound has been known to shatter windows, weaken foundations of buildings, and influence the health of humans and the productivity of farm animals.

CONCEPTS

- A. Sound results from vibrations set up in matter; some sounds are disagreeable or harmful.
- B. Sound is perceived by man when vibrations fall upon the ear drum and are transmitted through the ear and interpreted by the brain.
- C. Sound may produce physiological and/or psychological effects.
- D. Management of sound involves maintaining a balance in the use of sound for necessary purposes, e. g. sirens, unavoidable construction noise, and control of harmful or disagreeable sound.
- E. The development of proper human attitudes and the recognition of individual responsibility are prerequisites for adequate management of unwanted sound.

STUDENT OBJECTIVES

A. and B. The student will know that:

1. any vibrating matter produces sound
2. sound is characterized by the dimension of frequency and intensity
3. sound is measured in units (decibels)
4. the disagreeable aspects of sound are individual in nature
5. sounds may produce harmful effects on man and his environment.

C. The student will know that:

1. sound may produce physical effects, e. g. sonic boom, ultra-sonics, subsonics
2. sound may produce physiological effects, e. g. hearing loss, nausea, hypertension, etc.
3. sound may produce psychological effects, e. g. anxiety, insomnia, behavior changes, etc.

D. The student will know that:

1. some sounds are unavoidable, e. g. natural sounds
2. some sounds are inherent in human activities, e. g. sounds of civilization
3. tolerance of unwanted sound must be balanced in terms of needs and harmful or undesirable effects.
4. anti-noise legislation can be enacted, but effective implementation will depend upon society's willingness to accept the costs.

E. The student will:

1. know how and where to report violations against noise ordinances
2. know which agencies are capable of doing something about the enforcement of noise pollution laws.

MODULE 11

LAND DEVELOPMENT AND LAND USE PLANNING

OVERVIEW

A student must study and become involved in land use planning to understand environmental interaction and to realize that such planning will lead at best to minimal infringement on other living things. Such planning must recognize a hierarchy in living organisms, from man to fauna and flora, and must involve all life forms if maximum success, as defined by sound ecological principles, is to be achieved.

Environmental factors imposed by man can be resolved only by man. Similarly, natural factors affecting man's survival can only partially be resolved by him, with limited success and possible negative consequences to the environment.

Furthermore, man must realize that for successful operation in the biosphere all organisms require ample energy and reserves of resources; they require ample space to satisfy niche-habitat requirements and compatibilities. Intraspecific, interspecific and individual mechanisms and relationships are limited to these space-energy-resource concepts. Organisms which successfully utilize their environment realize maximum life styles.

CONCEPTS

- A. Students can be involved in land development and land-use planning activities.
- B. As man uses and develops land, his activities infringe on the freedom of other living things.
- C. For quality social development man has basic biotic and abiotic requirements for physical and mental well-being.
- D. Environmental factors, imposed by man can only be resolved by man; similarly, environmental factors imposed by nature, as they affect man's survival, can only be resolved by man with limited success and possible negative consequences to the environment.

- E. All organisms require ample energy for maintenance and ample space and physical resources to realize maximum life styles.

STUDENT OBJECTIVES

- A.
1. The student will obtain a data base on the geography of his area in terms of:
 - a. streets
 - b. water supply and treatment
 - c. topography and drainage
 - d. soil types
 - e. climate
 - f. native flora and fauna
 - g. history of the developing community (geological and man-made)
 - h. natural resources
 - i. waste disposal
 2. The student will obtain a data base on the social, political, cultural and economic aspects of the community in terms of:
 - a. architecture
 - b. transportation
 - c. laws
 - d. power structure
 - e. energy
 - f. communication
 - g. human resources
 - h. social organization
 3. The student will obtain a data base for past, present and projected land use as viewed by:
 - a. citizenry (all ages)
 - b. political organization at various levels: local, state, national
 - c. economic interests
 - d. available technology (automotive, housing, etc.)
 - e. current planning process.
 4. The student will become involved in designing a program for land use in his community.
- B. The student will prepare an Environmental Impact Statement by identifying the elements in his community that have infringed on other living things, such as:

1. the automobile
2. economic interests
3. recreation
4. resource needs
5. growth (people, goods and services)
6. energy production and consumption

C. The student will know that the following basic needs of man require utilization of space:

1. individual needs (territory)
2. family needs
3. cultural needs
4. recreational needs
5. economic needs
6. health needs
7. educational needs
8. communication needs: telephone, transportation, visual.

D.

1. The student will identify man-imposed environmental factors:
 - a. housing
 - b. production of goods and services (mining, recovery of natural resources, industry, agriculture)
 - c. recreation
2. The student will survey and understand the effects of man-imposed factors:
 - a. erosion
 - b. increased run-off
 - c. hydrologic problems
 - d. pollution
 - e. disruption of biotic communities
 - f. socio-economic-political decay
3. The student will identify, survey and understand the effects of natural disasters:
 - a. floods
 - b. tidal action
 - c. storms
 - d. geological upsets
 - e. forest fires

E.

1. The student will identify the requirements for a quality life-style in keeping with sound ecological principles as they relate to:

- a. space
 - b. interpersonal and intrapersonal relations
 - c. recreation
 - d. energy requirements
 - e. housing
 - f. job opportunities
 - g. education
 - h. transportation
 - i. communication
2. The student, as part of the ecological community, will determine priorities for his needs.
3. The student will carry out experiments with small communities in the laboratory and in the field to verify the ecological principles involved. He might, for example:
 - a. make a bio-assay on fish relative to water quality
 - b. make a bio-assay with plants relative to air, land and water quality.
 - c. maintain sow bugs in a terrarium to determine effects of space and food on a limited population.
4. The student will carry out studies to see the relationship of his community to other communities.
5. The student will document the results of his studies so that other communities may see inter-community relationships.
6. The student will be able to identify problems in his community that are common to other communities and which affect larger ecological communities.

MODULE 12

THE PROBLEMS OF SOLID WASTE AND RECYCLING

OVERVIEW

Solid waste is defined as material which has no use in its present form and location. It is generated in proportion to the activity of people, the growth of human populations and the kinds of individual life styles. Solid waste is moved from points of origin to points of environmental impact by both natural and human transport systems. It is important to identify the pathway of solid wastes, the forces influencing the choice of pathways and finally their influence on human and natural systems. Decisions regarding the management of solid waste materials are influenced by economics, technology and public concern. The individual is also in a position to influence decisions. To sustain human and natural systems, man must manage the production, transport and utilization of solid waste materials in ways that are consistent with sound ecological principles.

CONCEPTS

- A. Solid waste is material that has no use in its present form and place.
- B. Solid waste originates from the activity of people and is proportional to growth and current life styles.
- C. There are both natural and human transport systems for solid waste.
- D. To sustain human and natural systems, solid waste must be managed effectively.
- E. Individual decisions regarding management of solid waste materials are influenced by economics, technology and public concerns.

STUDENT OBJECTIVES

- A. The student will:

1. form his own definition of solid waste
2. identify and classify types of solid waste:
 - a. mining waste
 - b. industrial and domestic waste
 - c. junkyards
 - d. sewage waste
 - e. feedlot waste
3. identify and quantify wastes that his household generates within a given time.
4. make solid waste inventories of his own community.

B. The student will:

1. identify sources of solid waste:
 - a. industrial
 - b. the home
 - c. recreation
 - d. transportation
 - e. etc.
2. understand how present life styles and the standard of living increase the solid waste problems, e. g.
 - a. packaging
 - b. new processes and materials
 - c. consumer habits
3. understand how solid waste problems are proportional to growth
4. contrast the solid waste problems of the United States with those of other countries of the world.

C. The student will:

1. trace various solid wastes from source to disposal through natural and human systems
2. understand the biological, chemical and physical breakdown of solid waste:
 - a. role of micro organisms
 - b. geo-chemical cycle
 - c. radioactive decay

3. make an inventory of different methods of disposal:
 - a. burning
 - b. sanitary landfill
 - c. recycling
 - d. incineration
 - e. compacters, shredders
 - f. composting
 4. understand the environmental impact of various solid wastes:
 - a. problems of different types of wastes
 - b. problems of different disposal mechanisms
 5. understand the global impact of solid waste:
 - a. ocean dumping
 - b. ambient air
 - c. global ecosystems, bio-geochemical systems
 - d. resource transportation
- D. The student will:
1. understand the need for solid waste management
 2. understand the solid waste management program in his community
 3. understand the local, national and international controls of solid waste management:
 - a. laws and standards
 - b. political influence
 - c. economic influence
 - d. technological influence
- E. The student will:
1. understand a solid waste management program
 2. understand that solid waste is a potential resource
 3. understand that recycling of waste can be economically feasible
 4. understand that there are alternate solutions to solid waste management problems, and decisions must be made concerning them
 5. understand that there must be trade-offs in establishing priorities
 6. understand resource needs, technological research, the importance of quantifying the values of wastes and their impact on the environment

7. understand how consumer action and individual responsibility play an important part in the solid waste management problem
8. understand that there are increasing career opportunities in the field of solid waste management:
 - a. waste water treatment
 - b. land fill operations
 - c. recycling technology
 - d. environmental agencies
 - e. environmental education

MODULE 13

THE NATURE OF MAN AND HIS FUTURE

OVERVIEW

The purpose of this module is to give the student an understanding of the biological and behavioral nature of man. Man is dependent on his ever-changing environment for his own development, and as the dominant species in the biosphere his attitude and behavior toward the environment can determine its quality and future usefulness. Man is a complex being, often dynamic and resourceful, but sometimes short-sighted in his solution to problems. This module is intended to give the student the long-range view toward the environment and help him form proper attitudes and behavior patterns for the future.

CONCEPTS

- A. Man in his behavior, life styles and structural system is a complex organism.
- B. Man's behavior changed initially as a result of natural selection pressures and is continuing to change now as a result of artificial (man-created) selection forces.
- C. Man has attempted to solve problems for short-term gain without considering the long-term implications of his decision.
- D. Man's present actions, behavior, and values will determine his future but he can mold the future through planning.
- E. The sum total of man's experience, including his cultural heritage and his socio-economic beliefs, influences his formulation of solutions to problems.
- F. Man must structure new modes of thought in order to plan for the future.
- G. Man must learn to differentiate between that which has substantial worth and that which has transient value; the former he must respect and preserve.

- H. Exponential growth and resource consumption ultimately affects man's ability to preserve and plan his life on earth.
- I. Man is able to transcend his own environmental experiences in order to plan for the future.

STUDENT OBJECTIVES

- A. The student will:
 - 1. analyze present life styles
 - 2. develop two alternative scenarios for the future
 - 3. analyze his present life style in relation to problems he may encounter in the future.
- B. The student will:
 - 1. know man's past behavior patterns
 - 2. compare and contrast man's present behavioral patterns with those of the past
 - 3. understand natural selection forces and know how man has escaped them
 - 4. understand artificial selection mechanisms and know how man has employed them.
- C. The student will:
 - 1. cite examples in man's past and present of short-range solutions which have given rise to other problems
 - 2. using the same examples, explore possibilities which offer more desirable solutions
 - 3. structure an environmental frame of reference for problem solving.
- D. The student will:
 - 1. cite evolutionary pathways of human behavior and value systems and their implications for future behavior patterns.

2. cite behavior and value changes discussed in objective "A" either to prove or disprove the statement that change is inevitable.
- E. The student will recognize that man's approaches to problem-solving reflect his socio-economic-cultural beliefs.
- F. The student will:
1. cite past and present modes of thought which have had either negative or positive effects on the environment
 2. analyze present modes of thought as they have affected man and his environment today and their potential implications for the future.
 3. develop possible future modes of thought that might improve intra-and inter-personal interactions, interspecific interactions and the sum total of man-environment interactions.
- G. The student will:
1. list his own values and distinguish between those of substantial worth and those of a transient nature
 2. develop a community inventory reflecting community values.
- H. The student will recognize that relationships exist among exponential population growth, resource consumption, and the degradation of the environment.
- I. The student will:
1. investigate alternate states of consciousness as a means of transcending current experiences (meditation, dreams, bioenergetics, parapsychology, alcohol, drugs, hypnosis, yoga, etc.)
 2. select and participate in a sensitivity model different from his present life style.

MODULE 14

FOOD POLLUTION

OVERVIEW

Ingenious and revolutionary changes have occurred in methods of mass-producing, transporting, storing, packaging and marketing of food for modern man. However, in these changes there are inherent dangers and threats to man's health and survival. Artificial hormones, antibiotics, dyes, flavorings and preservatives have been added to food; remnants of fungicides and pesticides are found in agricultural products; wastes, poisons and refuse are sometimes included in large-scale food production.

Further, man's ignorance of basic food and nutritional requirements has made him the object of **exploitation** and profiteering by advocates of food fads, vitamins, etc. As a consequence, his diet is often not only inadequate but harmful.

The purpose of this module is to build an understanding of sound nutrition and an awareness of the problems inherent in mass-production and distribution of food.

CONCEPTS

- A. The composition of food is complex.
- B. The composition of food varies as a result of manipulation and contamination.
- C. The composition of food is modified to enhance its quality and quantity and for the sake of convenience.
- D. Food additions and deletions are the result of production and processing practices.
- E. Certain food and feed additives may constitute an immediate or long-range health hazard for organisms.

- F. Certain food and feed contaminants may constitute an immediate or long-range health hazard for organisms.
- G. The individual must recognize his responsibility and work cooperatively with other persons and agencies to ensure the proper production and distribution of food.

STUDENT OBJECTIVES

- A. The student will:
 - 1. list some of the component ^{or} parts of food
 - 2. categorize the components as either essential or non-essential.
- B. The student will distinguish between natural and man-induced contamination of food.
- C. The student will:
 - 1. distinguish between the various purposes of man's manipulation of food in terms of convenience, quality and quantity
 - 2. give examples of each of the above three purposes of manipulation.
- D. The student will:
 - 1. describe and give examples of how food production practices result in additions to food, e. g. hormones, antibiotics, steroids, enzymes, pesticides, and herbicides
 - 2. describe and give examples of how food preparation practices result in additions to food, e. g. trash, poisons, animal wastes
 - 3. describe and give examples of how food preparation practices result in deletion of food components, e. g. minerals, vitamins
 - 4. describe and give examples of how food processing practices result in additions to food, e. g. tenderizers, coloring agents, texturizers, hydroscopic agents, flavor enhancers, odor modifiers, vitamins, minerals, fillage.
- E. The student will:
 - 1. trace the influence of a food and feed additive on the organisms involved in a food chain.

2. distinguish between and give examples of immediate and long-range health hazards in organisms.
- F. The student will trace the influence of a contaminant on the organisms involved in a food chain.
- G. The student will:
1. describe how consumer demands account, at least partially, for the presence of food pollutants
 2. describe a means, other than that of dollar profit, for making a cost-benefit analysis of food additions
 3. describe how economic factors account for some additives in food, e. g. conveniences, transport, food appeal
 4. design and implement an individual course of action whereby the presence of food pollutants will be evaluated and remedial measures instituted
 5. design the means whereby an individual may implement a course of action through groups and responsible agencies
 6. participate in a group evaluation of a local problem and implement remedial action.

MODULE 15

WILDLIFE

OVERVIEW

The concept of wildlife should not be limited to what is sometimes known as wildlife but should include all varieties of living things. Wildlife is a precious resource because once the species is extinguished it cannot be recreated by any means presently available. Protection of wildlife is important for a variety of reasons, both aesthetic and utilitarian.

Efforts to preserve wildlife should not be concentrated merely on direct preservation of species and habitats but should look also to those human activities which affect the preservation of species.

Population growth and increased technology throughout the world are threatening wildlife on a global scale. Wildlife management, therefore, should be presented to students so that they will have a realistic and balanced view of the current situation.

CONCEPTS

- A. All wildlife species and varieties of life deserve protection from extinction, for a number of reasons:
 - 1. aesthetically, diversity of species makes earth an interesting, stimulating habitat for people of all tastes;
 - 2. ethically, man must recognize that non-human entities have their place in the ecosystem.
- B. Man's endeavors are related to the survival of wildlife species.
- C. An affluent society's increased growth, mobility, land use and power needs infringe on and destroy wildlife and its habitats.
- D. Earth's wildlife resources are finite.

- E. Wildlife has sometimes been mismanaged or exterminated because either man was threatened by nature or he miscalculated the abundance of life.
- F. Man must assume the responsibility for the continued existence and balance of all species.
- G. Certain species are currently in danger of extinction.
- H. Wildlife management requires international cooperation.
- I. The quality of wildlife is an effective environmental barometer for all species.
- J. A species' ability to change may not be equal to the demands placed upon it by man's manipulation of the environment.
- K. Native species may be better adapted to a habitat than introduced species, e. g. the native large game animals of Africa may produce more protein and less environmental damage than the cattle, goats, and sheep which have been widely introduced there.
- L. On the other hand, some introduced species may thrive and become pests due to a lack of natural enemies.

STUDENT OBJECTIVES

A. The student will:

- 1. recognize that all wild species are classified as wildlife
- 2. recognize that wildlife species are biological indicators of a quality environment for people
- 3. recognize that his individual effort can bring measurable results in rehabilitation of wildlife resources.
- 4. be able to define key terms such as aesthetic, habitat, and ethics
- 5. be able to carry out both qualitative and quantitative assessment of habitat and wildlife within his given area.

B. The student will:

- 1. be aware of what can happen to the quality of life when a single species becomes extinct

2. trace the influence of one species on another in an ecosystem
 3. be aware of the historical wildlife population within his and other geographical areas
 4. trace the influence of man on a given species
 5. develop a profile of those sources of influence
 6. suggest and defend means of controlling man's influence on a given species.
- C. The student will assess the effect of man's influence on wildlife habitat.
- D. The student will:
1. identify rare, endangered and extinct species
 2. analyze and discuss factors which have contributed to each of the following:
 - a. an extinct species
 - b. a species once endangered but now recovered
 - c. a species currently endangered
 - d. a species potentially endangered by foreseeable threats
 3. understand effects of human behavior on a given remote species
 4. know the methods by which groups may act to influence the welfare of remote species
 5. identify and comprehend the functions of government and non-government organizations dedicated to wildlife preservation and management.
- E. F. & G. - covered in previous objectives.
- H. The student will:
1. understand basic concepts of international law which govern wildlife species not indigenous to one nation
 2. describe migratory nature of selected species not indigenous to one nation
 3. describe current wildlife problems requiring international cooperation.

- I. The student will discuss examples of wildlife as an effective barometer for all species.
- J. The student will differentiate between natural and man-induced environmental change and the influence of both on species' rate of change.
- K. The student will give examples of natural species and introduced species and show how each has adapted to a habitat.

MODULE 16

ENVIRONMENTAL ETHICS

OVERVIEW

This module is designed to introduce the student to ethical standards of the past and present regarding the environment and to facilitate the formulation of a personal ethic.

Man must share the bounty of the planet Earth with all its present inhabitants and preserve it for future generations. He should be concerned about both living and non-living things which are part of this bounty and contribute to its variety.

Man must respect, too, the various cultures of his civilization. Some cultures are deteriorating because their values and customs have not kept pace with progress of technology. Cultures and technologies can produce reasonable material satisfaction and can preserve the diversity of life on the planet, but they must be modified when they infringe on the rights of present or future inhabitants of the Earth.

The overriding responsibility of societies and individuals is their stewardship of the Earth's resources.

CONCEPTS

- A. The environmental ethic is derived from a continuous process of examination of all available sources of information.

STUDENT OBJECTIVES

- A. The student will:
 - 1. examine the deterioration of cultural habits in societies at various levels of technological development.

2. define "environmental ethic"
3. articulate "environmental ethic" in his own terms
4. show knowledge of other ethical systems
5. compare and examine value systems
6. describe examples of "trade-offs" of certain economic/political situations
7. evaluate effects of consumer and convenience orientation and its relationship to environmental ethics
8. identify alternate lifestyles which are compatible or incompatible with environmental ethics
9. give examples of technological innovations which may have environmental side effects. Some of the innovations should be those meant to solve current environmental problems, e. g. electric auto.

MODULE 17

TECHNOLOGY: SERVANT OR MASTER

OVERVIEW

In this module technology is understood as applied science dealing with invention; and innovations rather than basic research. The student will attempt to assess the impact of technology on the dynamics and balance of the Earth's various life support systems to determine whether technology is or will become man's servant or master.

There are various opinions regarding technology and its relation to the environment. Some maintain that technology is neutral but its use by man has moral and environmental implications. Others argue that modern technology is so powerful that it causes a technological intermission which not only stops history but affects man's value and belief systems and behavior patterns. Two extreme positions on the issue can be identified: one is that technology can resolve all environmental and societal problems; the other would reject technology completely in an attempt to return to a lost arcadia. A more moderate position is taken by Rene Dubos and Lewis Mumford who argue for a humane technology tailored to human needs. They would advocate the use of advanced technology to modify and enhance the environment so that it will remain in productive harmony with man's best interests.

CONCEPTS

- A. Man must develop a clear understanding of the relationship of technology to the total environment. That understanding must be based on past, present and projected experience.
- B. Individuals must develop a concept of the impact of technology on their personal daily lives, on groups, societies and culture to gain a composite knowledge of the total interaction and impact that technology has on society.
- C. Technology has both potentially good and dangerous aspects. As long as man governs technology judiciously it will serve rather than enslave.

- D. At the core of a healthy technological society is the responsible individual who both initiates individual programs and cooperates with others in collaborative efforts.

STUDENT OBJECTIVES

A. The student will:

1. define technology
2. develop a case study of a predictive document which has been proven false by changing technology. Do this for both an unduly optimistic and an unduly pessimistic document
3. trace the important historical events and trends in man's development of and use of technology
4. discuss the conflicting ideas that Western Judeo-Christian philosophy is or is not primarily responsible for technologically-oriented societies
5. through appropriate discussion illustrate that at any given moment no one can predict the effect of technology in the future.

B. The student will:

1. discuss the idea, citing evidence that our modern world is or is not convenience-oriented, typified by consumership
2. exemplify ways in which technology has contributed to the arts, political science, and humane studies
3. cite examples of problems that presumably have technological solutions
4. cite examples of problems that presumably do not have technological solutions
5. explain why, if he had been given the objectives B1 and B2 20 years ago, his response to these objectives would be different. How will they differ 20 years from now?
6. cite examples of how his life style is affected by technology and how technology is affected by his life style

7. cite examples of how technology has made life easier
 8. conversely, discuss life style of a low-technology society which does or did enjoy leisure. Show that technology may, in some instances, reduce leisure.
- C. The student will:
1. discuss possible situations in which technology might be the servant of one group of people and the master of another at the same time
 2. give examples to show that technology may increase or decrease options. Show how gross applications of technology may increase options up to a point, and decrease them beyond that point, e. g. damming all of a river
 3. display understanding of cost-benefit analysis, including unaccounted for costs and benefits. Analyze a cost-benefit analysis of a proposed innovation
 4. cite positive and negative aspects of technology, giving specific examples
 5. show that acquisitiveness and overfaith in technology may reinforce each other
 6. defend a method of assessing the impact of technology on his community.
- D. The student will begin to formulate a personal philosophy regarding the degree to which technology will be his servant or his master.

MODULE 18

SOIL POLLUTION AND EROSION

OVERVIEW

Although the soil is merely a thin film that covers a small part of the Earth's surface, it is essential to life. The soil has many uses; it is the medium and the participant in essential ecological processes.

The cultural, social and economic development of different regions are related to the variations in soil from locale to locale. Man's future and the future of all life are dependent on the wise management of the soil both locally and internationally. The population increase makes it even more imperative that an intelligent conservation ethic regarding soil be developed.

CONCEPTS

- A. Soil is an essential commodity with various uses: biological, sociological, chemical, and physical (natural and man-made).
- B. Soil is the result of chemical and physical and biological changes. Some are natural, others are caused by man.
- C. The physical and chemical composition of soil varies, e. g. physically, in stratification and water-holding capacity; chemically, in its organic or inorganic composition.
- D. Soil is both a medium of and a participant in ecological processes, e. g., medium: decomposition, anchorage of plants, and habitat; participants: nutrient cycles, food chains, water cycles, and water purification.
- E. Man is capable of managing the soil in both positive and negative ways, e. g. cultivation, irrigation, mining, industrial landfill, construction, etc.
- F. Effective soil management in the future will require a soil conservation ethic which will govern management practices.

STUDENT OBJECTIVES

A. The student will:

1. recognize the role of soil in food production, food chains and antibiotic production
2. recognize the role of soil in demographic distribution of people
3. recognize the role of chemical composition of soil as a factor in cycles
4. recognize the role of soil in formation of depositional structures (deltas and flood plain)
5. recognize the uses of soil by man
6. recognize the soil's role in the transmission of certain diseases
7. understand the relation of soils to the cultural, economic and social development of different regions.

B. The student will:

1. recognize weathering as a mechanism which affects soil
2. know that man affects soil by mechanical means
3. know that chemical processes, both natural and man-made, affect soil change
4. know that biological processes affect soil change
5. know that climatic conditions affect soil
6. know that geological phenomena affect soil changes.

C. The student will:

1. recognize that the composition of soil varies chemically, physically and biologically
2. know that soil varies according to inorganic (trace elements, minerals) and organic components
3. know that physical structure of the soil varies as a result of stratification, particle size and water content.

D. The student will:

1. recognize that soil is a medium for ecological processes (decomposition, anchoring plants, habitat)
2. know that soil is a participant in ecological processes (nutrient cycles, food chains, water cycle, water purification).

E. The student will:

1. recognize aspects of soil management practices in agriculture (contour farming, crop rotation, range management, irrigation, overgrazing)
2. recognize aspects of soil management in forestry practices (reforestation, clear cutting, selective cutting)
3. recognize aspects of additives to the soil (pesticides, fertilizers, herbicides, water, salt)
4. understand the effects of technology on soil management practices (mining, pipelines, landfill, urban development pavement, construction of dams, etc.).

F. The student will examine a soil management practice and determine its consequences.

MODULE 19

WATER POLLUTION

OVERVIEW

Water is essential to life. This module deals with the importance of water in the life of man, its origin, uses and means of conservation. It is designed to develop an awareness of factors causing water pollution and depletion. Since the amount of water available for use is limited, abuse of water resources will bring about a catastrophe for man if left unchecked.

CONCEPTS

- A. Water is an essential resource.
- B. Water is a unique substance.
- C. Water has a variety of sources.
- D. Water is constantly being recycled.
- E. Man alters and uses water.
- F. Conservation of water is essential to continued life on Earth.

STUDENT OBJECTIVES

- A. The student will:
 - 1. understand the following terms: biological processes, photosynthesis, metabolism, homeostasis, evolution of life, environment for organisms
 - 2. discover ways in which water has sculptured the Earth, e. g. weathering, erosion, water as a global thermostat
 - 3. show that water is a medium for transportation in both natural and technological ways

4. investigate the importance of water in technology
5. name the contributions of water to the quality of life on Earth, e. g. aesthetically, recreationally.

B. The student will:

1. understand the anatomy of water (molecular, ionic), its heat capacity, states of water, water as a universal solvent, as a renewable resource and as a constant quantity
2. examine the kinds of water, e. g. salt, brackish, fresh
3. examine the forms of water, e. g. snow, ice, liquid, vapor.

C. The student will:

1. investigate industrial uses of water: chemical, nuclear, thermal, other means of changing and diverting water
2. study water uses and problems in his own locality:
 - a. chemical: chlorines, fluorines, detergents, softeners
 - b. sewage: humans and pets (eutrophication)
 - c. water shortages
3. analyze water uses in agriculture:
 - a. water and chemical, e. g. fertilizers, pesticides, herbicides
 - b. sediments
 - c. organic wastes, feedlots, cattle grazing
4. understand physical changes in water:
 - a. use of dams and canals
 - b. pavement and its influence on the water cycle
 - c. landfill as reclamation
 - d. removal of water from aquifers and desalination.

F. The student will:

1. investigate the relationship of the finite supply of water to the increase in population
2. understand the short circuit of water cycle shortage: pavement, canals, vegetation removal, landfill, evaporation

3. examine his attitude, behavior and individual responsibility toward water consumption and the need to cooperate with water conservation practices
4. study regulations and legislations dealing with water conservation and planning on the local, state, national and international levels.

MODULE 20

THE ENERGY CRISIS AND THE DEPLETION OF NATURAL RESOURCES

OVERVIEW

Increased world population in conjunction with increased per capita demand has raised the consumption levels of energy and natural resources to an alarming level. Research and applied technology have not yet discovered solutions to this environmental crisis.

It is essential that man understand the basic principles and interactions of matter and energy and examine closely the use and abuse of energy and natural resources in the past and present.

This module is designed to make the student aware of this environmental crisis and to provide a framework within which he might plan future use and management of natural resources. Such planning will include economic, political and sociological factors.

CONCEPTS

- A. Energy is found in several forms. The form of energy can change but efficiency is lost in the process.
- B. Within an ecosystem the recycling of matter and flow of energy are interrelated.
- C. Due to increased growth and consumption patterns, there is an increasing demand for resources that are limited.
- D. Increased resource demands have an increasingly profound impact upon the environment of the world.
- E. Resource use and development affects and is affected by economic, political, and technological systems.
- F. Solutions to this environmental crisis will require new technology, change in life styles and both short-and long-range planning.

STUDENT OBJECTIVES

A. The student will:

1. understand that the supply of energy is not constant
2. study the biological factors (sun, plants, food chains, webs, pyramids) and the physical factors (water, air, wind) in energy flow.

B. The student will:

1. trace matter cycles both biological (e. g. carbon, nitrogen, oxygen, water) and physical (e. g. rock cycles)
2. understand the interaction between material cycles and energy flow.

C. The student will:

1. gain an historical perspective of the crisis by studying early man and agricultural, industrial and technological uses of resources
2. understand the current situation by making an inventory of resources and by studying sources, depletion rates, limits and distribution of natural resources
3. will plan projections for the future by examining exponential usage, new sources, trade-offs, recycling and anticipated requirements.

D. The student will:

1. examine the following factors which have influenced natural resources in the past: destruction of forests in Europe, dust bowls and ocean dumping in the United States, wildlife extinction
2. examine the following factors which are currently influencing supplies of natural resources: land scars, loss of open space, oil slicks, radiation, thermal, blackouts, disposal problems
3. examine the following factors which will influence projections for the future: ramifications of total depletion, pollution increase, globalization of impact, increased impact on natural and man-made systems.

E. The student will:

1. study economic factors in the use of natural resources, e. g. markets, transportation
2. examine local, regional and international political factors contributing to the crisis.
3. study the uses of technology in developed and underdeveloped nations, e. g. support systems, production of electricity, steel, etc.

F. The student will:

1. examine technological advances which will contribute to a solution to the crisis, e. g. new energy sources, alternative synthetic resources, recycling
2. show ways in which changes in life styles, attitudes, values, beliefs and behavior will solve this crisis
3. show the necessity of establishing priorities and planning trade-offs and realize that new solutions may create new problems.

APPENDIX I

HOW TO INITIATE AN ENVIRONMENTAL EDUCATION PROGRAM

Two workshop groups attempted to outline ways to initiate an environmental education program in a school. The approach taken by the first group is different from that of the second group which chose to use a process orientation. The teacher who wishes to begin an environmental program will find helpful suggestions in both plans.

APPENDIX I-A

HOW TO INITIATE AN ENVIRONMENTAL EDUCATION PROGRAM

I. Preliminary Research

- A. Find the needs of the community.
- B. Find a value system which is acceptable to the community.
- C. Be prepared to show who will benefit from such a program and what the benefits will be.
 1. Who will benefit: students, parents, community, general public.
 2. Benefits in General:
 - a. a sense of community will be developed
 - b. persons can identify with the community
 - c. people can make sound decisions and can become intelligent, informed voters
 - d. greater enjoyment in life will result
 - e. real problems will be identified and solutions found
 - f. students will be better prepared for future careers
 - g. a sense of responsibility will be developed.
 3. Benefits to the School:
 - a. school will become more relevant for students
 - b. absenteeism will diminish
 - c. school will become involved in contemporary issues
 - d. departmental barriers will break down
 - e. the community will come into the school
 - f. the school will have greater community support and interest from an enduring program.
 4. Benefits to the Community:
 - a. the community will be cleaner, healthier and more beautiful
 - b. a sense of community will develop
 - c. people will become community oriented

- d. students will be prepared for political action
- e. new resources will be identified.

5. Benefits to Parents:

- a. parents will receive consumer education information from students
- b. family relations may improve
- c. problems will be shared with children
- d. conservation will improve
- e. problems will be identified and decision makers located
- f. communication with groups and agencies will improve, e. g. industry, community and civic groups, citizen and parent groups, communications media, school board, administrators, teacher organizations, etc.

II. Program Implementation

- A. Conduct a workshop for all concerned people in the school and community. Participants should participate in the activities of the students. Process learning activities should be employed.
- B. Form an environmental education committee of concerned people.
- C. The environmental education committee should address itself to the following tasks:
 - 1. Design a curriculum which will meet the needs of the local community.
 - 2. Plan a training program for teachers and administrators who will implement the program.
 - 3. Find ways to involve resource agencies in the program.
 - 4. Collect material for a Resource Center and make an inventory of environmental problems in the community.

III. Resources for Reinforcement

Government Resources: Federal, State, Local

U. S. Forest Service
 National Park Service
 U. S. Office of Education, Environmental Education Office
 U. S. Corps of Engineers
 Soil Conservation Service

Bureau of Land Management
U. S. Department of Agriculture
Environmental Protection Regional Office
State Departments of Education
State Departments of Natural Resources
Departments of Health
President's Environmental Merit Awards Program

Others

Local Universities
Conservation Associations
ERIC - Educational Research Information Center
Recreation Groups
National Education Association
Zero Population Growth - Education Department
Inservice Training Groups
Sierra Club
Coalition for Environmental Quality
Environmental Information Center, New York
The Conservation Foundation
Common Cause
National Academy of Science Audubon Society
ACCESS

Periodicals

Environmental Quality
Catalyst
Environmental Action
Environmental Action Bulletins
Journals of Environmental Education
Conservation Newsletter
Environment Monthly
Clear Week
Sierra Club Newsletter
Journal of Environmental Quality
Wildlife Management Institute Bulletin
American Forests
Audubon
Natural History Magazine
EPA Periodic Report
Environment
Scientific American
Journal of Outdoor Education
Parks and Recreation
Journal of Soil and Water Association

Arizona Highways
New York Conservation
Nevada Highway
Department of Interior Annual Report
U. S. D. A. Yearbooks

APPENDIX I-B

HOW TO INITIATE AN ENVIRONMENTAL EDUCATION PROGRAM

OUTLINE OF PROCESS MANUAL ON INTRODUCING
ENVIRONMENTAL EDUCATION IN SCHOOLS

- I. Find out where you are.
 - A. Obtain a community profile.
 1. Population
 - a. density
 - b. distribution
 - c. ethnic groups
 2. Necessities
 - a. housing
kind
maintenance
age
setting
utilities
services (hospitals, etc.)
 - b. food
shopping
diet
package
price
quality, quantity
water quality
selection

- c. clothing
 - dress code
 - general appearance
 - quality
 - social customs
 - adequacy
- d. transportation
 - existence, number of modes
 - cost
 - frequency
 - local control
 - options
 - automobile ownership
- e. services
 - kinds that exist
 - quality
 - cost
 - needed services
 - planning

3. Distribution of Wealth

- a. how many on poverty level
- b. zoning
- c. bank clearings
- d. industrial base
- e. per capita cost
- f. who are the wealthy
- g. professionals

4. Cultural Factors

- a. parks
- b. education
- c. quality of media
- d. fine arts
- e. informal societies
- f. leisure recreational opportunities
- g. cultural factors
- h. social factors
- i. non-conforming minorities

5. Political Factors

- a. local climate in terms of environment
- b. conservation tradition

- c. party registration
- d. political platforms
- e. sense of political effectiveness
- f. environmentally sensitive industries
- g. availability of state and federal funds
- h. ideological climate - liberal, conservative
- i. role of citizens and students in democratic process

II. Find out with whom and what you are working?

A. Who?

- 1. School Board
- 2. Student action groups
- 3. Community action groups
- 4. Service Clubs
- 5. Local sportsmen
- 6. Citizen advisory committee
- 7. Teachers and teacher organizations
- 8. Local/state/federal agencies
- 9. Philanthropic organizations
- 10. Money people
- 11. Specifically designated contact people
- 12. Community resources
- 13. Museums and libraries
- 14. Human resources with experience and/or time
- 15. Media (TV, newspapers)
- 16. Churches
- 17. Industry
- 18. Youth organizations
- 19. Professional societies
- 20. State conservation associations
- 21. Senior citizens

B. What are your non-human resources?

- 1. Sites
- 2. Parks
- 3. School lands (Sections 16 and 36)
- 4. BLM (HEW) land
- 5. Physical facilities
 - a. banks
 - b. churches
 - c. schools
 - d. residential
 - e. ranger stations

6. Equipment
 - a. military surplus
 - b. industry
 - c. local business
 - d. government agencies
 - e. used school equipment
 - f. school equipment now in use
 - g. student-produced equipment
 - h. computers
 - i. video
 - j. printed media

III. How to Proceed

A. Ways to Proceed:

1. Teacher workshop
2. Student-teacher meeting
3. Ad hoc alliance
4. Decision-makers: where is the power; identify and convert
5. Build support groups, develop teams
6. Heterogeneous groups
7. Resource inventory
8. Influence administration
9. Sand in their eyes
10. Squeaky wheels
11. Venus emerging
12. Deus ex Machina (no sex education)
13. The Pill is a "no no"
14. Problem Appraisal
15. Examination of school philosophy (work within the system)
16. Don't work uphill
17. Machiavelli was right
18. Find the barons
19. Know your enemies and more about them
20. The early bird catches the worm
21. Gamble: take risks
 - take the chance
 - risk being fired
22. If someone doesn't have the time, forget him
23. People are easy to change
24. If someone reacts enthusiastically and hasn't done something a week later, give him just one more chance.

B. How to educate and train: methodology

1. Full time educational alternatives
2. Awareness, transition, operation, problem studies

3. Start where people are
4. Develop basic process (mutual ways to trust or demonstration projects and national models, go occupational, system pays for it)
5. Peer teaching
6. Students train teachers
7. DO SOMETHING

C. Mechanisms for Beginning

1. State law
2. Environmental Education Coordinator at each school
3. Develop questions for use in supervision-recognition procedures
4. Environmental Education Ombudsman
5. School clubs
6. National Programs that exist, e. g. President's Environmental Recognition Program, STEP, NEED, NESA
7. Eyeballing
8. Information seminars
9. Work forums, create ad hoc groups
10. BLITZ - facilitated work session
11. Community Projects
12. In-service teacher training days
13. Local research: study school as environment
14. Advertise through the media
15. Cookies - car wash
16. Resale
17. Recycle
18. Organic garden
19. Summer programs

D. Mechanisms for Reinforcement

1. Recognitions and awards
2. Media publicity
3. Money
4. Resources from the community
5. Success
6. Self-esteem
7. Building in a feedback system
8. Meet school needs (save them money)
9. Serve the school
10. Community service
11. Involve many teachers
12. In-service training
13. Actual college programs
14. Each one teach one
15. Plutonic ladder (TTT, TT, etc.)
16. Students make presentation

17. Linkages with educational institutions, e. g. higher education, other school systems
18. Unexpected program locations (do novel things)
19. Existing state-Federal resource people, e. g. Forest Service
20. Distribute, publish nationally
21. Presentation at national meetings

E. Long Term Maintenance

1. Reallocation of resources
2. Network
3. Institutionalize: make it self-renewing, don't let it die, don't let it be coopted, develop an organization.
4. High participation
5. Continue outreach
6. Grow and deepen
7. Continually check process (process management)
8. Make it the formal curriculum
9. Take over the system
10. Use existing fads
11. Build demonstration areas in which community has vested interest
12. Give people a stake in it.

APPENDIX II

UTILIZING THE MODULAR STRUCTURE IN THE REGULAR SCHOOL CURRICULUM

The following suggestions are categorized in three ways to serve on the following three levels: national, state and local. On each level recommendations are made for utilizing the modules developed at the workshop.

National

Using the President's Environmental Award as an incentive, a teacher might use a module to arouse student interest in developing a project based on the modules.

State

The modular curriculum might be introduced to the state board of education through pilot programs (in service) to test effectiveness of module at local level.

Check to see if a state law exists which makes an environmental education curriculum mandatory.

If there is an environmental specialist at the state level, send a copy of the modular curriculum to that person.

Local

Survey the sophistication level of teacher's knowledge of environmental education on the local scene. Find out what they are thinking and actually doing in this area.

Deal mainly with teachers, but include administrators, if only on the information level. The prime target should be local individuals who are highly motivated. Use students to facilitate program.

Create work-study projects or workshops to analyze and study the modules. Teachers who attend should be reimbursed for their time. Such projects may be conducted during the summer with subsequent evaluation made during school year on release-time days.

Plan direct cross flow between districts using the modular approach or any successful environmental project. Let people see alternate approaches.

Put a copy of Teaching for Survival by Mark Terry or something similar into everybody's hand.

Institute inservice workshops with the help of state and local people to introduce the environmental modular curriculum. Such workshops should be accredited by a local university and credit should be applicable to certificate renewal. Participants should be reimbursed for their time.

Teachers who are running pilot programs should be responsible for evaluating them. They should share their experience and findings with other teachers in workshops and in teacher-to-teacher help programs. See attached form for example of "help module".

Find alternate systems which might be interested in using this modular approach in their educational programs, e. g. forest service, park service, etc.

An interdisciplinary approach should be the ultimate objective. Work through chairman of all departments to find ways of integrating environmental materials with other courses. Develop cross flow with other courses.

Train substitute teachers in the modular approach who will be available in the absence of regular staff.

EDITOR'S NOTE: This form is used in the Los Angeles County School District for inservice meetings of teachers to develop multi-disciplinary programs in environmental education. This is provided as an example of what might be useful.

LOS ANGELES COUNTY SUPERINTENDENT OF SCHOOLS OFFICE
155 West Washington Boulevard
Los Angeles, California 90015

To:

Program: "What the Smog Warning Plan Means to Your Teaching"
(Inservice Meeting for Teachers, Grades 1 - 6)

District: Claremont Unified School District

Location: Chaparral School, 451 Chaparral Drive, Claremont

Date: November 12, 1970

Time: 3:30 p.m. to 5:00 p.m.

Goal: Development of an ecological conscience in students through a multi-disciplinary approach to individual perceptive awareness of the interrelationship of the human being to his earth.

Objective: It is hoped that a multi-disciplinary program concerned with the ecological process will begin to evolve; and through this program, the student will understand that he is not only a part of but affects the ecological process.

Group Leader

It will be your responsibility to give leadership to the group discussion in this area of _____ pollution, and to appoint a recorder for your group.

Guidelines for Involvement (25 minutes)

1. Take a few minutes and have each member of your group list all of the things they can think of that cause _____ pollution.
2. As a group discuss _____ pollution.

3. Relate each of the subject areas to _____ pollution.

- a. How can Language Arts be used to teach about _____ pollution?
- b. How can Music be used to teach about _____ pollution?
- c. How can Visual Arts be used to teach about _____ pollution?
- d. How can Homemaking be used to teach about _____ pollution?
- e. How can Industrial Arts be used to teach about _____ pollution?
- f. How can Health, Physical Education and Recreation be used to teach about _____ pollution?
- g. How can Mathematics be used to teach about _____ pollution?
- h. How can Science Education be used to teach about _____ pollution?
- i. How can Social Studies be used to teach about _____ pollution?

Recorder's Report (3 minutes maximum)

The recorder or group leader will report results to the total group.

"What the Smog Warning Plan Means to Your Teaching"

Inservice Meeting for Teachers - Claremont Unified School District -
November 12, 1970

(This form is to be used by the recorder and turned in to Don Hornell
at the end of the meeting.)

Recorder _____ Group _____

A. Language Arts

B. Music

C. Visual Arts

D. Homemaking

E. Industrial Arts

F. Health, Physical Education, and Recreation

G. Mathematics

H. Science Education

I. Social Studies

APPENDIX III

UTILIZING THE MODULES AS A SEPARATE COURSE

The teachers, administrators, and boards who seek to utilize these modules for a self-contained course in environmental education should plan carefully. The following planning elements should be considered:

1. Review all possible approaches and choose the most appropriate;
2. Give primary emphasis initially to local problems and resources, extending these later to regional, national and international levels;
3. Maximize student involvement in selection of topics and action programs;
4. Utilize the people and resources of the community;
5. Provide for continuous evaluation and revision, since environmental problems constantly change in kind, number and scope;
6. Supplement the suggested modules with locally developed ones where needs and interests dictate,

The materials presented here were developed for flexible use by a wide variety of teachers and schools. It is not expected that they be used in any predetermined order. The individuality of the teacher, the ability and cultural milieu of the students, needs and problems of the community should all operate to determine the patterns of instruction.

I. Types of Courses

The following structures are suggested for presenting a program in environmental studies. A strong environmental course is interdisciplinary in that it must cross disciplines and be multi-disciplined. The course structure should meet the unique needs of the student in his particular environment as he interacts with it. Important elements of course structure are: consideration of individual student, school, and community needs; development of student awareness through exposure to methodologies and concepts; syntheses of all principles and disciplines; development of personal involvement of student.

- A. Science based course (physical, biological or social)
- B. Problem oriented course
- C. General survey course
- D. Humanities oriented course
- E. Multi-disciplinary course

II. Who Teaches

- A. There are many ways of teaching, but they are not all equally effective in helping people learn.
- B. Whether an individual instructor or team of individuals is employed, a specific subject-matter oriented mode of teaching is not as important as sincere and personal commitment on the part of the teacher.
- C. The following are considered important elements for teacher-student success:
 - 1. The teacher should be a facilitator who is personally committed;
 - 2. The instructor should be deeply interested in solving environmental problems and in helping students to understand the environment;
 - 3. He should be able to communicate enthusiasm;
 - 4. He should be aware of alternate strategies which he should approach with an open mind;
 - 5. He should be able to integrate information;
 - 6. He should be honest in admitting his own feelings and biases;
 - 7. Team teaching is a desirable teaching approach; however, one should be aware of its possible negative aspects, e. g. potential administrative and/or interpersonal conflict.

III. Format and Structure

The course should be designed to facilitate active teacher-active student relationships. The following are suggestions for structuring the course:

- A. Seminar
- B. Independent studies
- C. Audio-tutorial
- D. Open-circuit T. V. - video-tape
- E. Modular field trip format
- F. Expert-specialist (guest lecturer)
- G. Lab and field trips
- H. Student contract

IV. Materials and Resources

No single standard reference can produce an adequate understanding of the many disciplines incorporated in the course subject matter. Therefore, it is suggested that a multitude of materials and resources be used. The instructor should attempt to impress upon the student the need for exposure to a mass of materials in order to understand the diversity and complexity of environmental studies.

A. Resources might include:

1. Class
2. School site
3. Community
4. Political resources
5. Local, state and national resources
6. Self developed activity resources
7. Business and industries
8. The student as a resource
9. Home and family
10. National and international resources

V. Goal of High School Environmental Studies

The goal of a high school environmental program should be to make each student aware of environmental problems and concerned enough about them to become involved in actions and programs to improve the environment.